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IS 7562 (1974): Gold cladding [MTD 10: Precious Metals]

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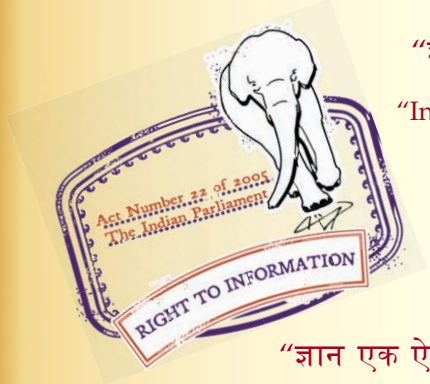

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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS : 7562 - 1974

Indian Standard

SPECIFICATION FOR GOLD CLADDING

UDC 669·218·681

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110001

[redacted] Gr 3

May 1975

AMENDMENT NO. 1 FEBRUARY 1984

TO

IS:7562-1974 SPECIFICATION FOR GOLD CLADDING

Alteration

(*Page 4, clause 4.2, line 2*) - Substitute '583.3/1 000' *for* '585/1 000'.

(SMDC 13)

Reprography Unit, ISI, New Delhi, India

Indian Standard

SPECIFICATION FOR GOLD CLADDING

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Indian Standard

SPECIFICATION FOR GOLD CLADDING

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 December 1974, after the draft finalized by the Precious Metals Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Gold cladding on various basis metals and alloys such as bronze, nickel-silver, gilding metal and silver is produced by bonding gold alloy sheet to a sheet or bar of the basis metal by means of co-rolling, soldering and sweating, casting, heavy chemical deposition or heavy electroplating. The bonding is usually carried out at high temperature and under heavy pressure, the whole being rolled or drawn together in such a way that on annealing and pickling, a surface of gold will appear.

0.3 The gold-clad material in the form of sheet, both single and double; plate; strip; wire; or tube is used in the manufacture of less expensive types of jewellery, watch cases, watch straps, optical frames, fountain pens, propelling pencils, cosmetic containers, vanity cases, etc.

0.4 The gold-clad material has an advantage that the gold being bonded and wrought is much harder and has greater resistance to wear and corrosion.

0.5 This standard contains clause **B-1.1** (Note) which calls for agreement between the purchaser and the supplier.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers requirements for gold cladding in the form of sheet, both single and double; plate; strip; wire and tube used in a wide range of products.

*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Rolled-Gold — Covered on one surface with a layer of gold alloy to form a clad metal and the proportion of the alloyed gold to the weight of the entire metal is less than 1/20.

2.2 Gold-Filled — Covered on one or more surfaces with a layer of gold alloy to form a clad metal and the proportion of the gold to the weight of the entire metal is not less than 1/20.

2.3 Gold Shell — A casing of gold alloy on silver or base metal, the casing being of such thickness that when the base metal is dissolved in acid, the gold shell is left intact.

3. SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of material shall conform to IS : 1387-1967*.

4. QUALITY AND PROPORTION OF THE GOLD

4.1 Fineness of Gold in Gold-Clad Material — Gold-clad material in rolled gold, gold-filled or gold shell shall have a fineness not less than 375/1 000.

4.2 The gold used for this purpose could be either of the finenesses 375/1 000 or 500/1 000 or 585/1 000 or 750/1 000 or 916/1 000.

4.2.1 Method as given in Appendix A shall be used for determining the fineness of gold.

4.3 The relative proportion of the weight of gold-clad alloy to the weight of the entire metal in the article shall be 1/10, 1/15, 1/20, 1/25, 1/30, 1/40, 1/50, 1/60, 1/80 and 1/100.

4.3.1 The method of test as given in Appendix B shall be used for determining the thickness.

5. DESIGNATION

5.1 Gold-clad material shall be designated on the basis of the fineness of the gold used for cladding and the proportion of weight of gold to the entire metal. For example, grade 1/10-750 shall mean that gold cladding is of 750/1 000 fineness and its weight in proportion to the entire metal is 1/10.

*Specification for general requirements for the supply of metallurgical materials (*first revision*).

6. GOLD CONTENT

6.1 The gold content of rolled gold, gold-filled and gold shell shall not be less than 95 percent of the designated marking.

7. TEST FOR DISTINGUISHING ROLLED GOLD ARTICLES

7.1 Immerse the article in dilute nitric acid (1 : 3) heated to about 40°C. The acid attack is continued until all the basis metal has been dissolved, leaving a residual film of gold. In case of rolled gold article the upper surface shall be bright but the lower surface is dull and brown or black in colour.

8. ADHESION TEST

8.1 Gold-clad material shall satisfy the following requirements of the bend test.

8.1.1 *Bend Test* — Place the sample in a bend testing machine with a bending radius of 4 mm (or in the jaws of a suitable vice). Bend the sample as far as 90° backwards and forwards. For the purpose of this test, one bend shall constitute bending to 90° and back to its original position. The sample shall withstand three bends without detachment of the coating.

9. TEST FOR UNIFORMITY OF GOLD CLADDING

9.1 A cross section of uniformly cut gold-clad article, by visual examination, shall appear uniform.

10. MARKING

10.1 Gold-clad articles shall be marked with the designation as per **5.1** and name or trade-mark of the manufacturer. In case it is impracticable to mark the clad article, a label marked with the designation or trade-mark of the manufacturer shall be securely attached to the article.

10.1.1 Gold-clad articles may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

11. SAMPLING AND INSPECTION

11.1 Sampling for Acceptance of a Lot — For the purpose of acceptance, a lot shall be divided into sub-lots consisting of 100 articles or part

thereof of such articles as are clad at one time in the same batch. Two samples will be selected from each sub-lot and subjected to the appropriate tests.

11.2 Criteria for Acceptance — If these samples pass the tests, the sub-lot represented by them shall be accepted. If one or both the samples should fail, two further samples shall be selected from the same sub-lot and subjected to the tests. If these samples pass the tests, the sub-lot shall be accepted. If any of the second set of samples fails in any test, the sub-lot shall be rejected.

APPENDIX A

(*Clause* 4.2.1)

TEST FOR FINENESS

A-1. DETERMINATION OF FINENESS BY FIRE ASSAY METHOD

A-1.1 Outline of the Method — The sample is dissolved in dilute nitric acid and the residue after the addition of double the amount of silver is cupelled along with sufficient amount of lead. The resulting gold-silver

A-2.9 Tongs and Forceps — of various forms, for charging the cupels, and handling assay pieces.

A-3. REAGENTS

A-3.1 Check Gold — of fineness 999·9.

A-3.2 Silver — free from gold.

A-3.3 Lead Foil — of pure lead.

A-3.4 Parting Acid No. 1 — Dilute nitric acid (2 : 3) (*v/v*) containing a trace of silver nitrate.

A-3.5 Parting Acid No. 2 — Dilute nitric acid (2 : 5) (*v/v*) containing a trace of silver nitrate.

A-4. PROCEDURE

A-4.1 Preparation of Assay Piece — Cut a suitable piece of such a size from the sample so that the weight of gold is not less than 10 mg. The area should be noted as it is required for use in the determination of thickness under **B-1.**

A-4.1.1 Cut the piece into small pieces and weigh accurately, transfer to a tall shaped 400-ml beaker and add 25 ml of parting acid No. 1, cover with a watch-glass and heat on a hot-plate till all the basis metal is dissolved, adding more acid, if necessary.

A-4.1.2 Remove the beaker from the hot-plate, cool, dilute it with about 100 ml of water, filter through filter paper No. 1, wash thoroughly with hot water till the filtrate is colourless.

A-4.1.3 Dry and ignite the paper in a porcelain or silica crucible carefully avoiding any loss.

A-4.1.4 Transfer the residue from the crucible to a lead foil weighing 4 to 5 g and add accurately weighed 0·25 g of check gold and enough silver so as to make up the total silver content between 2 and 2·5 times the amount of gold.

A-4.1.5 Wrap the lead foil carefully and squeeze in the balling pliers to form a small ball. The assay piece shall now be considered ready for charging in the cupellation furnace.

A-4.2 Cupellation — Arrange the cupels carefully in the muffle, preferably on a removable tray. When the cupels have attained the furnace temperature of about 1000°C, place in them the assay pieces (*see* **A-4.1.5**) each in its proper cupel, by means of long cupellation tongs. The charging-in should be done carefully, but as rapidly as possible, so as not to cool the

muffle unduly. Close the muffle door and allow the cupellation to proceed for 20 to 30 minutes depending on the amount of lead used, the temperature being raised to about 1050°C towards the end. The end of the cupellation is shown by the appearance of bright globules of gold-silver alloy. The cupels may be withdrawn from the furnace when the temperature comes down to approximately 850°C in the furnace, or the buttons are solidified.

A-4.3 Preparation of the Assay Piece for Parting

A-4.3.1 Remove the buttons from the cupels by means of a pair of forceps and clean with a stiff brush. Flatten the buttons on a polished anvil with a polished hammer. Anneal the flattened buttons at about 800°C and pass in succession through the rolls to form elongated fillets of thickness 0·25 mm and number them serially. After being rolled, anneal again to soften them and then separately roll up between the finger and thumb into a 'cornet' or spiral, making the lower side of the button the outer face of the cornets.

A-4.3.2 Place the cornets in the respective cups of the parting tray and immerse the entire tray in parting acid No. 2 at a temperature of 90 to 92°C and boil for 20 to 30 minutes or until no more nitrous fumes are observed. Take out the tray and drain the acid liquor, then wash by dipping in and out of a vessel of hot distilled water, drain again and immerse in a second pot of boiling parting acid No. 1. Boil the cornets in this way for 20 to 25 minutes, drain and wash thoroughly. Dry the tray with the cornets by gently heating and then anneal in a muffle heated to 800°C for about 5 minutes. The cornets which before annealing are of a dull brown colour and friable now assume a bright gold yellow colour, diminish in size and harden. The cornets when cold are ready for weighing.

A-4.4 Check Assays

A-4.4.1 Certain losses and gains are incurred in the various operations of assay due mainly to losses of gold and retention of silver by cornet. The net sum of these losses and gains is called surcharge. The surcharge shall be determined by means of check assays or 'checks' of similar composition as sample or samples being assayed. The checks shall be made according to the known composition of the sample or from the data obtained by preliminary assay. Check gold shall always be used for the preparations of the checks and taken as the standard against which all assays shall be compared.

NOTE — If negative surcharge is obtained, the assay shall be repeated.

A-4.4.2 The checks shall be subjected to the same operations side by side and under identical conditions with the assay pieces. The cornet is weighed and surcharge is determined. The number of checks shall not be less than two for each group of assays and shall be positioned evenly in the group.

A-4.4.3 Weigh the cornets and apply correction for surcharge as determined under **A-4.4.2** to the weight obtained. Deduct the weight of check gold which was added during preparation of assay piece under **A-4.1.4** to get the weight of pure gold in the sample.

A-4.5 Calculation

$$\text{Fineness per mille} = \frac{M_1 \times 1\,000}{M_2 \times P}$$

where

M_1 = mass in g of the pure gold as in **A-4.4.3**,

M_2 = mass of the sample taken, and

P = proportion of the alloyed gold to the entire metal in the article as marked on the article.

NOTE — In the above calculation, the value of P as given by the manufacturer is assumed to be correct.

APPENDIX B

(*Clauses* 0.5 *and* 4.3.1)

METHOD OF TESTING THICKNESS

B-1. THICKNESS TEST

B-1.1 The thickness of the coating in microns shall be determined as:

$$T = \frac{M_1 \times 100}{A \times D \times \text{purity percent}} \times 10^4$$

where

T = thickness of the coating in microns,

M_1 = mass of pure gold obtained as in **A-4.4.3**,

A = area of the test piece in cm^2 as determined under **A-4.1**, and

D = density of the alloyed gold in g/cm^3.

Purity percent as determined from the weight of pure gold obtained under **A-4.4.3**.

NOTE — Density may be taken either as the theoretical density of gold alloy of the composition or some nominal density of an alloy approximately similar to the gold alloy as agreed between the purchaser and the supplier.

INDIAN STANDARDS

ON

PRECIOUS METALS

IS:

639-1965 Gold leaf (*revised*)
1417-1971 Grades of gold and gold alloys (*first revision*)
1418-1972 Method for assaying of gold in gold and gold alloys (*first revision*)
1953-1973 Methods for chemical analysis of silver anodes (*first revision*)
2112-1962 Grades of silver and silver alloys
2113-1972 Methods for assaying of silver in silver and silver alloys (*first revision*)
2270-1965 Methods for assaying of platinum and platinum alloys
2271-1967 Recommended method for spectrographic analysis of platinum
2275-1963 Grades of platinum
2278-1963 Fine gold bar, sheet, wire, granules and token (*LAGDI* or *MOHUR*)
2279-1963 Fine silver bar, sheet, wire, granules and token (*LAGDI* or *MOHUR*)
2767-1964 Gold thread (silver base)
2790-1964 14, 12 and 9 carat gold
3088-1967 Method for assaying of fine grade palladium
3095-1965 Solders for use in goldwares
3096-1965 Fine grade palladium
3110-1965 Silver leaf
3111-1965 Silver thread
3112-1965 Gold and silver embroidery material
3541-1966 Code of practice for manufacture of 14 and lower carat gold alloys
3571-1966 Dental gold solders
3578-1966 Dental gold alloy wire
3610-1966 Dental gold foil
4134-1967 Recommended colour classification of rough diamond
4704-1968 Silver-tin dental amalgam alloy
4705-1968 Dental mercury
4799-1968 Dental casting gold alloys
5320-1969 Fine silver ingot
5954-1970 Dental white gold alloys
6018-1971 Platinum, platinum-rhodium catalyst gauzes
6019-1971 Platinum dish
6170-1971 Platinum crucible and lid
6683-1973 Diameters for wires of platinum group metals and their alloys
6882-1973 Platinum electrodes
6889-1973 Method for chemical analysis of silver-tin dental amalgam alloy
6890(Part I)-1973 Methods for chemical analysis of dental gold alloys: Part I Determination of gold, silver, copper, palladium and platinum
7225-1974 Dental cobalt-chromium casting alloy
7255(Part I)-1974 Methods of chemical analysis of solders for use in goldware: Part I Determination of gold, silver and copper

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